Library Resources and Technical Services. Vol.35, p191-201, 1991.
ISSN: 0024-2527

www.ala.org

User Acceptance of Library Catalog Results: An Exploratory Study

Tschera Harkness Connell is a doctoral student, Graduate School of Library and Information Science, University of Illinois at Urbana-Champaign.

This study explores whether a student user is more likely to believe the results obtained from an online system than from a manual system. Findings indicate that, overall, they are equally likely to believe either system. However, students' familiarity with the title searched made a difference. Students who had heard of a book but found no record for it were more likely to distrust the computer. When the book was unfamiliar and no record was found, they were more likely to distrust the card catalog.

The purpose of this study is to examine user beliefs about the accuracy of information found in manual and computer catalogs in libraries. Specifically, this study is an examination of whether a user is more likely to believe an answer received from a computer system than one received from a manual system.

User acceptance is one very important factor in the successful implementation of computer systems and services. As computers become more common in libraries, it is important to examine users' attitudes and beliefs about the new systems.

It is a fairly common observation of librarians that users uncritically accept answers received from library computer systems. Whether or not users accept the results of computer catalogs more readily than they accept the results of paper catalogs has never been determined. When users consult paper catalogs they can see the complexity of the catalog, even if it is not understood. This complexity is especially apparent in card catalogs where the quantity of information on a record may be extensive. Users who observe erasures might recognize the potential for errors, and ask questions about information they do not understand. In online catalogs, however, the human input is invisible. This "lack of transparency of the system interacts with users' tendencies to believe blindly in the results that it gives."[1] The user assumes that the information presented is correct, or worse, complete. For the purposes of this study, this unquestioning acceptance of the catalog's completeness will be defined as belief in the catalog.

Hypothesis 1
Users are more likely to believe the results obtained from a computer catalog than they are the results obtained from a manual catalog.

Whether or not users are willing to accept the information in the catalog (automated manual) might depend upon their familiarity with the material sought. For example, if a patron seeks material used previously it would not be surprising if upon not finding that particular item, the patron asks for help. Similarly, if an item is well known or currently popular, a patron might express doubt about not finding the title in the catalog.

Hypothesis 2
Users are more likely to disbelieve answers from a catalog that indicates that the library does not own an item if that item is known by or familiar to die user. Likewise, users are more likely to accept answers that indicate that the library does not own an item, if the item is unfamiliar to them.

Hypothesis 3
Users are more likely to believe the results from a computer catalog than the results from a manual catalog and the strength of this belief is influenced by whether or not the material sought is familiar to the user.

Very little literature addresses the specific issue of whether or not people believe the results obtained from computers. However, writers and scholars from many fields have debated the effects of computers on society in general. Recent literature has concentrated on the effect of the new technologies on individuals. Studies that have examined the effects of computers in libraries have focused on employee reactions to new technologies or on patterns of patron use of online catalogs.[13]

Only two studies were found that examined patron attitudes toward computers and automated library catalogs. In a study on the "Effects of Age, Gender, College Status, and Computer Experience on Attitudes toward Library Computer Systems (LCS)," Koohang identified three types of attitudes toward computers: computer anxiety (fear of computers or computer learning), computer confidence (computer efficacy), and computer liking (defined as enjoyment of computers and their use).[4] Computer experience is the only factor that significantly affected student attitudes, specifically computer anxiety and computer liking.

Noble and O'Connor looked at the relationship of user attitudes toward computer technology and acceptance of a specific online library catalog.[5] They found that although users exhibit contrasting attitudes toward Computer technology in general, the acceptance of a specific technology—in this case the catalog (96.7% acceptance)—could be high.

The following survey statement used in the Noble and O'Connor study is particularly relevant to this investigation: "In the library computer, records are more reliable than card/microfiche records."[6] Both groups of students, those who trusted the computer and those who did not, tended to agree, although the results were not significant.

Methodology

The principal methodological question for this study is how to measure belief. Different kinds of searches require different approaches to the catalog. In a broad survey-interview process, the researcher would have to have a very large sample to make sure that belief in catalog results, and not user knowledge of searching techniques, was being tested.

The fact that many searches are not comprehensive must also be considered. A user might be searching for a few good items, or for a particular item. In the first instance, belief as defined by this study makes little sense. Presumably, anything found that is related to the search query is acceptable. In the second case, belief refers to accuracy and completeness.

In a 1980 study on the identification and characterization of computational estimation processes, Reys identified individuals with good mathematical estimation skills.' These individuals were asked to estimate the answers to math problems, then check their answers by using a calculator. The calculators were programmed to give systematic errors in computing, first

by a factor of 10 %, then 25%, then 50 % —all above the actual answer. It was found that even good estimators were reluctant to question unreasonable results.

The catalog, like the calculator, can be alerted to give incorrect results to selected questions as a way of testing belief. Reys' methodology serves as a model for the present study. Because of the difficulties of obtaining a sample large enough to study multiple lands of catalog use, only author and title searches for particular items are used.

The study requires a site where the collection coverage by the automated and the manual system is identical. This is necessary so that the researcher can be assured that belief rather than knowledge of the scope of a library's catalogs was tested for.

Two groups of college students were compared in their use of library catalogs. One group was assigned to use a card catalog, the other group an online circulation system. A combination student exercise and survey was used to gather data. The exercise required the students to search the assigned catalog for records of 3 items. The students then answered questions based on the information found. They also completed a survey about their use of libraries and computers.

Setting

Students participating in this study were from the Library Research Methods classes at Millikin University in Decatur, Illinois. Since the late 1970s, Millikin has required students to take a one semester hour library research methods course. Most students take this course during their freshman year. The course emphasizes developing and implementing search strategies for finding information in the library. Practical skills include instruction in the use of the card catalog, the online circulation system (Library Computer System, or LCS), and, recently, the online catalog.

Millikin has been a member of the LCS network since 1979 and has its entire holdings in LCS. With the statewide adoption of Illinet Online (IO), Millikin also has its holdings in full bibliographic record (FBR) format. Millikin maintains a card catalog.

Six sections of the Library Research Methods were offered during the 1989 spring semester. Three sections totaling 95 students (all die sections of one instructor) comprised the sample of students used in this study.

.

Design of Experiment

Questionnaires were distributed to 95 students in 3 sections of Library Research Methods. Six students pretested the questionnaire and 89 were given the questionnaire as an out-of-class assignment. All students were assigned to use-either the card catalog or LCS. LCS was chosen rather than the newly installed Illinet Online because it is simpler to use and the students had had more practice using it. It has been shown that many students do not understand the distinction between an online circulation tool and a catalog, and will use the limited system as if were a catalog.[8] For the kind of search performed for this study, a finding list is all that is required.

This experiment used 9 titles representing 3 levels of familiarity: known, familiar, and unknown. Known items are currently popular items or items that have been presented to students in class. Familiar items are items the researcher assumed students would know either because the titles are well known (but not current) or the title has a familiar ring. Unknown items are tides that are highly specialized and not likely to be titles that undergraduate students, especially freshmen, would have encountered.

Three of the 9 tides could be found in the Millikin catalogs. Each student received a questionnaire consisting of titles tides—1 from the group in the Millikin catalogs and 2 that were not in the catalogs. This process assured each student the possibility of one search success. The

specific grouping of the 3 titles with each questionnaire was determined randomly. After all the questionnaires were collated, they were interleaved so that every other questionnaire directed the student to use the card catalog. This interleaving assured random assignment of the 2 catalogs. Each student used only one catalog for all 3 searches.

For each of the 3 titles assigned, the students were asked to indicate first, whether they had heard of the book and second, to predict whether or not Millikin owned the book. The students then searched for the title in the assigned catalog and answered questions about their findings. The students were instructed to use only the tool assigned. They were specifically asked *not* to go to the library shelves and not to discuss the questions with library staff or other students.

The nine titles used for the experiment are:

Known: Kane, Joseph Nathan. *Famous First Facts Statistical Abstract of the United States*
King, Steven. *Dead Zone*

Familiar: Nixon, Richard Milhouse. *The White House Experience*
Mitchell, Margaret. *Gone with the Wind* Crichton, Michael: *The Great Train Robbery*

Unknown: Mtesigwa, Angelo M. *The Politics of Agriculture in Ukerewe*
Rogers, Everett M. *Diffusion of Innovation* Seeta, Prabhu K. *Pesticides Use in India Agriculture*

In the known group, the first two titles had been presented to the students and emphasized in class. The third is a well-known, popular title by Steven King. For the experiment, the record for *Famous First Facts* had been removed from both catalogs. This item provided a test for whether students were more likely to distrust the negative results of their search for a known item than for an unknown item. The King work is not owned by Millikin.

In the familiar group, *The White House Experience* is a fictitious but plausible title. This title was used to test whether the question, "Have you heard of this book?" actually gave an indication of whether or not a book was known to the student. The Crichton work is not owned by Millikin.

The third group, representing unknown items, contained two books on the subject of agriculture outside the United States. These two books are not owned by Millikin. The third book, which is owned by Millikin, is quite specialized and not likely to have been encountered by freshmen.

Data Analysis and Results

Response Rate Inclusion of Pretest results

Sixty-three usable questionnaires were returned (66% rate of return), including the 6 that were returned during the pretest. The pretest process included individual interviews with each student to determine the clarity of the questionnaire, and the potential validity of the familiarity groupings of the books. The interview took place after the student had completed the questionnaire. One title used in the pretest (Agatha Christie, *Appointment with Death)* that had been assumed to be known, was not familiar to the pretest group. This title was replaced with the Steven King work in the actual experiment.

The analysis was performed first excluding, and then including the pretest student responses. There are no significant differences in results between the two methods so the analysis presented here will include the pretest. The 2 pretest cases of the Christie book were not included

in the analysis. Therefore, the 63 usable questionnaires returned yielded 3 x 63 - 2 = 187 cases.

Student Search Skills

Before testing the 3 main hypotheses, a number of assumptions need to be noted. The students in the research methods classes had already had lessons and practical assignments on how to use the catalogs. Hence, it is assumed that students' search skills are good. The tabulated responses to the statement, "I found a record for this book in the catalog" (or .on LCS) for each of the titles used in the experiment are shown in table 1.

The overall accuracy rate of 93 % (174/187) indicates that the students' search skills are good. Errors that did occur are of two types: (1) finding a record when no record exists, and (2) failure to find a record that does exist. Only 2 errors were of the first type. As expected, most errors were of the second type. Of the 10 errors of the second type, *Statistical Abstract* seemed to present the most problems. Only 73% of the students searching for that title found it. In fact, 6 of 10 errors of the second type are searches for this title. It is worth noting that the 10 failures of the second type were evenly distributed between the 2 catalogs.

Type of Disbelief in the Catalog

In this experiment, student disbelief in the catalog could be 1 of 2 types. First, the student might believe that Millikin does not own the book even though a record for the book is found in the catalog. Second, the student might believe that Millikin owns the book even though the catalog has no record for the book.

Table 2 shows that almost all disbelief was of the second type. The table compares students' answers to whether or not they found a record for the book in the catalog with their answers to whether or not Millikin owns the book.

In 56 cases, students found a record in the catalog. In only 1 (2 %) of these cases did the student disbelieve the catalog. Disbelief of the first type is rare.

In 130 cases, students found no record for the book in the catalog. In 9 (7 %) of these cases, students said that they believed that Millikin owned the book anyway. Thus, most disbelief is of the second type.

In 4 of the 130 cases when students found no record, the student did not answer whether or not Millikin owned the book. Upon examining the responses for these 4 cases more closely, 2 appear to be instances of oversight. The answers to the follow-up scalar question indicate that the students were very sure Millikin did not own the book. The other 2 cases may reflect uncertainty on how to answer the yes-no question. In one case, a response for *Dead Zone,* the student indicated on the scalar question that he was very sure that Millikin owned the book. The other, a response for *Famous First Facts,* gave the call number for the book, crossed it out and wrote "I was sure Millikin owned this book." Despite instructions, the student obviously went to the shelves.

Belief in the Catalog

Hypothesis 1

Users are more likely to believe the results obtained from a computer catalog than they are the results obtained from a manual catalog.

Null hypothesis 1

There is no difference between students' mean belief (M_l) in the results obtained from LCS and the

mean belief (M_c) in the results obtained from the card catalog: $M_c = M_l$.

This analysis is based on the 130 searches indicating that the book record was not found. As discussed above, most disbelief in the catalog occurs when the student does not find the record.

Using the student response to the question "Does Millikin own this book?" the X^2 statistic was calculated to determine the amount of discrepancy between the responses for the two catalogs (see table 3).

Using the catalog type as the independent variable and belief as expressed in the dichotomous variable "Does Millikin own this book?" as the dependent variable, there is not enough discrepancy between the two catalogs to reject the null hypothesis ($X^2 = 4.20$; significance level = .12). Students are not significantly more likely to believe the results obtained from a computer catalog than they are the results obtained from a manual catalog. In fact, seven students disbelieved the computer catalog while only two disbelieved the card catalog.

Testing the hypothesis using the scalar question addressing certainty of belief also shows that there is not enough evidence to reject the null hypothesis. Mean belief is measured oh a scale from 1 to 10. A students responds "1" to indicate certainty that Millikin *does not* own the book and "10" to indicate certainty that Millikin *does* own the book. As above, search successes have been eliminated. The sample mean belief for the card catalog was 2.88, and for LCS, 3.00. At-test to determine the difference between the means produces a value of t = - .24, which corresponds to a .81 level of significance. The type of catalog does not significantly influence the degree of student belief in search results.

Familiarty and Belief

The first step of the analysis is to determine whether the researcher-defined categories of "known," "familiar," and "unknown" match the students' familiarity with the items. The researcher intended that all students would have heard of the three "known" books, and that many students would have heard of the three "familiar" books. Table 4 shows that the expectations for "known" books failed. The unknown category does represent books unknown to the students. However, the known and familiar categories failed to support expectations. *Statistical Abstract,* although presented to the students in class, is predominantly unknown. Sixty-eight percent of the students searching for that title said that they had never heard of it.

The hypothesis below deals with the effect of familiarity on students' beliefs in the catalog search results. Because of the low student recognition of the "known" *Statistical Abstract, the* hypothesis tests will exclude *Statistical Abstract.* The hypothesis tests had already been restricted to the 130 cases of books not found in the catalog, six of which were *Statistical Abstract.* Exclusion of these 6 now reduces the number of cases to 124.

The remaining 124 cases were used to test researcher defined familiarity groupings. The results of this analysis are much more in line with familiarity predictions (see table 5).

Hypothesis 2

Students are more likely to disbelieve answers from a catalog that indicates that the library does not own an item if that item is known or familiar to the user. Conversely, students are more likely to accept answers that indicate that the library does not own an item if the item is unfamiliar to them.

Null hypothesis 2

Whether a book is known, familiar, or unknown makes no difference as to whether a student believes Millikin owns the book: $M_k = M, = M,,$ (where
M_k = mean belief for "known" items;
M_f = mean belief for "familiar" items;
M_u = mean belief for "unknown" items,
all measured on the scale from 1 to 10).

The null hypothesis was tested by comparing the students' responses to the scalar question "How certain are you that the Millikin library owns this book?" to the known, familiar, and unfamiliar categories. Using one-way analysis of variance, the null hypothesis was rejected at the .03 significance level. On the scale of 1 to 10, the sample mean for the known group is 2.82 (n = 37), die mean for the familiar group is 3.53 (n = 47), and the mean for the unknown group is 2.03 (n = 40). The degree of student familiarity with the item does influence whether or not the student believes the catalog.

Scheffe's test shows that the greatest difference between the mean belief for the three groups is between the familiar and the unknown group. The sample means for the familiar and unknown groups yield a difference of 1.51 with a standard deviation of 0.57. Students are more likely to distrust negative answers for familiar items than they are for unknown items. Recall that a student uses a response of "1" to indicate complete certainty that Millikin does not own the book.

Another way to test this hypothesis is to use 2 groups of familiarity as defined by student responses to the yes/no question "Have you heard of this book?"

Null hypothesis 2a

Whether a student has heard of the book makes no difference as to whether a student believes Millikin owns the book: $M_y = M_n$ (where M_y = mean belief for cases where the student answered "yes" that he or she had heard of the item; M_n = the mean belief for cases where the student answered "no"; both M_y and M_n are
on the scale from 1 to 10). Analysis of variance comparing these two groups with the scalar data indicating students' certainty that Millikin owned the book shows a significant difference between belief and familiarity with the book. The sample mean for the familiar books is 3.44 (n = 54), and for the unfamiliar books, 2.37 (n = 70). The difference between these means is 1.06 with a standard deviation of 0.48. The probability that the differences between the 2 means would occur by chance alone is less than .03.

TYPE OF CATALOG AND FAMILIARITY, THEIR EFFECT UPON BELIEF

Hypothesis 3

Users are more likely to believe the results from a computer catalog than the results from a manual catalog and the strength of belief is influenced by whether or not the material sought is familiar to the user.

Null hypothesis 3a
$M_c = M_l$
$M_k = M_f = M_u$
$M_{ck} = M_{cf} = M_{cu} = M_{lk} = M_{lf} = M_{lu}$

(M = mean belief; c= card catalog; l= LCS; k= "known"; f = "familiar"; u = "unknown").
Null hypothesis 3b
$M_c = M_l$
$M_y = M_n$
$M_{ey} = M_{en} = M_{ly} = M_{ln}$
(M = mean belief; c= card catalog; l= LCS; y = student has heard of item; n = student has not heard of item). All means are measured on the scale from 1 to 10.

TABLE 1
STUDENTS' SEARCH SKILLS
(n = 187)

Student Found Record for Book in Catalog	Record for Book is Actually in Catalog: Yes	No	Total
Yes	54	2	56
No	10	120	130
No Answer	0	1	1
Total	64	123	187

TABLE 2
DOES MILLIKIN OWN THE BOOK?
(BASED ON STUDENTS' SUCCESS IN FINDING RECORD IN CATALOG)
(n = 187)

Student Found Record for for Book in Catalog	Response to the Question "Does Millikin Own This Book?": Yes	No	NA	Total
Yes	55	1		56
No	9	117	4	130
No Answer			1	1
Total	64	118	5	187

TABLE 3
DOES MILLIKIN OWN THE BOOK?
(SEARCH SUCCESSES ELIMINATED)
(n = 130)

Type of Catalog	Response to the Question "Does Millikin Own This Book?": Yes (%)	No (%)	No Ans (%)	Total (%)
Card Catalog	2	62	1	65
	(3.1)	(95.4)	(1.5)	(50)
LCS	7	55	3	65
	(10.8)	(84.6)	(4.6)	(50)
Total	9	117	4	130
	(6.9)	(90.0)	(3.1)	(100)

TABLE 4
FAMILIARITY GROUPINGS OF BOOKS
COMPARED WITH STUDENTS' ACTUAL FAMILIARITY WITH BOOKS
(n = 187)

Book Title Grouped by Experimental Categories	Have You Heard of This Book? Yes (%)	No (%)	Category Totals —Summary— Yes (%)	No (%)
Known				
Famous First Facts	12 (66.7)	6 (33.3)		
Statistical Abstract	7 (31.8)	15 (68.2)		
Dead Zone	17 (81.0)	4 (19.0)		
Total known (61 items)			36 (59.0)	25 (41.0)
Familiar				
White House Experience	10 (45.5)	12 (54.5)		
Gone With The Wind	22 (95.7)	1 (4.3)		
Great Train Robbery	14 (63.6)	8 (36.4)		
Total familiar (67 items)			46 (68.6)	21 (31.3)
Unknown				
Politics of Agriculture	0	23 (100)		
Diffusion of Innovation	0	19 (100)		
Pesticides Use in India	0	17 (100)		
Total unknown (59 items)			0	59 (100)

TABLE 5
FAMILIARITY GROUPINGS OF BOOKS
COMPARED WITH STUDENTS' ACTUAL FAMILIARITY WITH BOOKS
(ELIMINATING *STATISTICAL ABSTRACT* AND BOOKS FOUND IN CATALOC)
(n: 130 - 6 = 124)

Adjusted Researcher-Defined Familiarity Categories	Response to Question "Have You Heard of This Book?" Yes (%)	No (%)	Total (%)
Known	27 (73.0)	10 (27.0)	37 (100)
Familiar	27 (57.5)	20 (42.5)	47 (100)
Unknown	0	40 (100)	40 (100)

The analysis of this hypothesis tests belief in terms of the interaction between the students' familiarity with an item and their use of a particular catalog. The set of null hypotheses was tested by using two-way analysis of variance. First, the procedure was performed using the "known," "familiar, “and "unknown" categories for familiarity. The results showed that there were significant differences between the familiarity categories (at the .03 level of significance) but there

was no significant difference between the 2 catalogs. This corresponds to the analysis and results of hypotheses 1 and 2 above. There is not enough evidence to reject the null hypothesis (3a) for interaction f (.11 level of significance).

The hypothesis was tested again using students' responses to the yes-no question, "Have you heard of this book?" as the basis of familiarity. The overall hypothesis is supported at the 0.02 level of significance. The probability that average belief depends upon whether the student had heard of the book is high (.03 level of significance).

That differences are due to the interaction between the familiarity categories and the type of catalog is also apparent (0.035 level of significance). The interaction is as follows. First, students are more likely to believe negative results from the card catalog than they are negative results from LCS. Second, if the book is unfamiliar to them, students are more likely to believe negative results from LCS.

Summary and Conclusions

Interest in this study was stimulated by the frequent assertion found in library literature that users approach online catalogs less critically than they do manual systems. The assumption is that users are likely to believe that the results obtained from computer systems are more complete and accurate than results obtained from manual systems. This exploratory study does not support that assertion.

For the purposes of this study, belief in the catalog is defined as unquestioning acceptance of the results of a search. Students were asked to search for specific items and then to answer questions concerning their findings. Belief is measured by whether or not students questioned their results when no record for die item was found.

The students in this study are no more likely to believe the results obtained from a computer catalog than they are the results obtained from a card catalog. What did affect belief is the degree of familiarity with the item searched. Researcher-defined groups of "known," "familiar," and "unknown" items were tested against the degree of students' belief as expressed on a scale of 1 to 10. One indicates that die student is sure Millikin did not own the book; 10 indicates that the student is sure Millikin does own the book. The differences in belief that occurred between the familiarity groups would occur by chance alone less than 3 % of the time. Using 2 groups of familiarity as defined by the students' answers to whether or not they had heard of the title, produced significant results at the .02 level of significance.

The third major hypothesis tested relates to the interaction between the familiarity of the item and the type of catalog and their combined effect on student belief. Using 2 levels of familiarity as determined by whether or not the student had heard of the book, the results show that there were significant differences between the familiarity categories and that these differences were due in part to the type of catalog used (.035 level of significance). If students had heard of the book and they did not find a record for it in the catalog, they were more likely to distrust the answer from the computer than the answer from the card catalog. If the book is unfamiliar to them and they find no record, they are more likely to distrust the answer from the card catalog.

In this experiment belief was tested only in terms of specific item searches. Only 9 % of all the records not found in the catalog were questioned. This is despite the fact that the students had seen in class, in the library, one of the titles not in the catalog. The students knew how to search for records in the catalog and many of the items were familiar to them. The fact that the catalog (computer or manual) is so little questioned under these circumstances suggests that users probably accept, unquestionably, the results of all catalogs.

Belief can be defined and measured in many ways. This study compares user expectations in searching for specific items with the results obtained. Even if a particular title was unknown to the student, the success of the search is easily determined by whether or not a record for the title was found. Perhaps a search, such as a subject search, that is less easily defined might cause the user to question his or her skills and ask for help. Perhaps a user who finds too many, or too few items, or finds items not quite on target, will question the results. This is an area for further study.

Another area for investigation would be a test of adults on their belief in the results obtained from catalogs. Are adults more likely to question unexpected results than students? The sample in this study is a group of students with instruction in library skills. Does the students' knowledge of the library influence the degree of belief? This would be another area for study.

The students selected for the pretest were chosen because their instructor considered them to be particularly inquisitive. One of these students, when asked to explain the difference between his prediction that the book he had seen in class was owned by the library and the fact that he was unable to find it, wrote "I was sure Millikin owned it, but if the catalog says the book is not in the library, I believe it." It appears that even good students with good library skills are reluctant to question the catalog.

REFERENCES

1. Leigh Estabrook, "The Human Dimension of the Catalog: Concepts and Constraints in Information Seeking," *Library Resources & Technical Services* 27:69 (1983).
2. Kathryn Luther Henderson, "Human Considerations in Library Automation," in *Summary of Proceedings, Fortieth Annual Conference of the American Theological Library Association* (St. Meinrad, Ind: American Theological Library Assn., 1986), p. 185-230.
3. Joseph R. Matthews, Gary S. Lawrence, and Douglas K. Ferguson, *Using Online Catalogs: A Nationwide Survey* (New York: Neal-Schuman Publishers, 1983); Carole Weiss Moore, "User Reactions to Online Catalogs: An Exploratory Study," *College & Research Libraries* 42:295-302 (1981); David J. Norden and Gail Herndon Lawrence, "Public Terminal Use in an Online Catalog: Some Preliminary Results," *College & Research Libraries* 42:308-16 (1981); Carolyn Pawley, "Online Access: User Reaction," *College & Research Libraries* 43:473-77 (1982).
4. Alex A. Koohang, "Effects of Age, Gender, College Status, and Computer Experience on Attitudes Toward Library Computer Systems (LCS)," *Library & Information Science Research* 8:349-55 (1986).
5. Grant Noble and Steve O'Connor, "Attitudes toward Technology as Predictors of Online Catalog Usage," *College & Research Libraries* 47:605-10(1986).
6. Ibid.,p.606.
7. R. E. Reys and others, *Identification and Characterization of Computational Estimation Processes Used by Inschool Pupils and Out of School Adults. Final Report,* ERIC Documentation Reproduction Service No. ED 197 963 (Washington, D. C.: National Institute of Education, 1980).
8. Pawley, "Online Access."